

## CLAIMS

What is claimed is:

1. A method for chemical treatment of biological tissue, comprising the steps of:
  - (a) providing a quantity of biological tissue which contains connective tissue protein; and,
  - (b) contacting the biological tissue with a solution under oxidizing conditions for sufficient time to impart enhanced stability compared to traditional means of fixing connective tissue protein within the biological tissue.
2. A method according to Claim 1 wherein the oxidizing conditions are provided in step (b) by heating the solution in the presence of oxygen.
3. A method according to Claim 2 wherein the presence of oxygen is provided by ambient oxygen in the solution.
4. A method according to Claim 2 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas solution.
5. A method according to Claim 2 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.
6. A method according to Claim 1 wherein the oxidizing conditions are provided in step (b) by combining an oxidizing agent with the solution in the presence of oxygen.
7. A method according to Claim 6 wherein the oxidizing agent is selected from the group of oxidizing agents consisting of a peroxide, a compound containing peroxide, hydrogen peroxide, a periodate, a compound containing periodate, sodium periodate, a

diisocyanate compound, a halogen, a compound containing halogen, n-bromosuccinimide, a permanganate, a compound containing permanganate, ozone, a compound containing ozone, chromic acid, sulfonyl chloride, a sulfoxide, a selenoxide, and combinations thereof.

5           8. A method according to Claim 6 wherein the presence of oxygen is provided by ambient oxygen in the solution.

9. A method according to Claim 6 wherein at least some of the oxygen present is provided by allowing the solution-oxidizing agent mixture to contact atmospheric air,  
10 oxygen or an oxygen-containing gas mixture.

10. A method according to Claim 6 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

15           11. A method according to Claim 1 wherein the oxidizing conditions are provided in step (b) by irradiating the solution in the presence of oxygen.

12. A method according to Claim 11 wherein the solution is irradiated by a type of radiation energy selected from the group of alpha ionizing radiation, beta ionizing  
20 radiation, ultraviolet radiation, electron beam radiation, gamma rays, and combinations thereof.

13. A method according to Claim 11 wherein the presence of oxygen is provided by ambient oxygen in the solution.

25           14. A method according to Claim 11 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas mixture.

15. A method according to Claim 11 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

16. A method according to Claim 1 wherein the solution is flowing.

17. A method according to Claim 16 wherein the flowing of the solution is effected by placing the solution and the tissue in a container, wherein the solution is heated and circulated through the container.

18. A method according to Claim 1, wherein step (b) comprises the steps of:  
placing the tissue in a solution containing 0.2-2.0 % glutaraldehyde;  
maintaining the glutaraldehyde solution at 25-70 °C for a period of  
0.5-60 days; and,  
removing the tissue from the glutaraldehyde solution.

19. A method according to Claim 18 wherein the solution has a glutaraldehyde concentration of about 0.625%.

20. A method according to Claim 19 wherein the 0.625% glutaraldehyde solution is maintained at about 45-55 °C for a period of between about 7 and 14 days.

21. A method according to Claim 1 wherein the solution is a fixative.

22. A method according to Claim 21 wherein fixative is glutaraldehyde.

23. A method according to Claim 21 wherein fixative is Denacol.

24. A method according to Claim 1 wherein the solution is peroxide.

25. A bioprosthesis comprising tissue that has been prepared by a method comprising the steps of:

(a) providing a quantity of biological tissue which contains connective tissue protein; and,

(b) contacting the biological tissue with a solution under oxidizing conditions for sufficient time to result in crosslinking of connective tissue protein within the biological tissue.

26. A bioprosthesis according to Claim 25 wherein the oxidizing conditions in step (b) are provided by heating the solution in the presence of oxygen.

27. A bioprosthesis according to Claim 25 wherein the presence of oxygen in step (b) is provided by ambient oxygen in the solution.

28. A bioprosthesis according to Claim 25 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas solution.

29. A bioprosthesis according to Claim 25 wherein at least some of the oxygen present in step (b) is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

30. A bioprosthesis according to Claim 25 wherein the oxidizing conditions are provided in step (b) by combining an oxidizing agent with the solution in the presence of oxygen.

31. A bioprosthesis according to Claim 30 wherein the oxidizing agent is selected from the group of oxidizing agents consisting of a peroxide, a compound containing peroxide, hydrogen peroxide, a periodate, a compound containing periodate, sodium periodate, a diisocyanate compound, a halogen, a compound containing halogen, n-

bromosuccinimide, a permanganate, a compound containing permanganate, ozone, a compound containing ozone, chromic acid, sulfuryl chloride, a sulfoxide, a selenoxide, and combinations thereof.

5           32.     A bioprosthesis according to Claim 30 wherein the presence of oxygen is provided by ambient oxygen in the solution-oxidizing agent mixture.

          33.     A bioprosthesis according to Claim 30 wherein at least some of the oxygen present is provided by allowing the solution-oxidizing agent mixture to contact atmospheric  
10   air, oxygen or an oxygen-containing gas mixture.

          34.     A bioprosthesis according to Claim 30 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the  
15   solution.

          35.     A bioprosthesis according to Claim 25 wherein the oxidizing conditions are provided in step (b) by irradiating the solution in the presence of oxygen.

          36.     A bioprosthesis according to Claim 35 wherein the solution is irradiated by a  
20   type of radiation energy selected from the group consisting of: alpha ionizing radiation, beta ionizing radiation, ultraviolet radiation, electron beam radiation, gamma rays, and combinations thereof.

          37.     A bioprosthesis according to Claim 35 wherein the presence of oxygen is  
25   provided by ambient oxygen in the solution.

          38.     A bioprosthesis according to Claim 35 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas mixture.  
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39. A bioprosthesis according to Claim 35 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

5 40. A bioprosthesis according to Claim 25 wherein the solution is flowing.

41. A bioprosthesis according to Claim 40 wherein the flowing of the solution is effected by placing the solution and the tissue in a fixation container, wherein the solution is heated and circulated through the container.

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